

NON-PUBLIC?: N  
ACCESSION #: 9105070075  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: HOPE CREEK GENERATING STATION PAGE: 1 OF 5

DOCKET NUMBER: 05000354

TITLE: TURBINE TRIP ON MOISTURE SEPARATOR HIGH LEVEL RESULTS IN  
REACTOR  
SCRAM DUE TO MOISTURE SEPARATOR LEVEL CONTROL SYSTEM  
MALFUNCTION  
EVENT DATE: 11/17/90 LER #: 90-028-01 REPORT DATE: 04/30/91

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION:  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:  
NAME: Richard Cowles, Senior Staff TELEPHONE: (609) 339-3431  
Engineer - Technical

COMPONENT FAILURE DESCRIPTION:  
CAUSE: B SYSTEM: SB COMPONENT: V MANUFACTURER: V085  
REPORTABLE NPRDS: N

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On 11/17/90 at 0352, during performance of a surveillance procedure which tests the Main Turbine Combined Intermediate Valves (CIV), the "A" Moisture Separator experienced a high level condition. In response to this high level condition, the associated dump valve began to open, but level continued to rise, and the main turbine tripped on moisture separator high level. Immediately following the turbine trip, the reactor scrammed on a Turbine control Valve Closure signal from the Reactor Protection System. All controls rods were verified to be inserted, and plant systems responded as expected. Investigation subsequent to the scram determined that the initiating cause of this event to be a malfunction of the level control system for the "A" Moisture Separator. During the stations third refueling outage,

inspection and testing of "A" Moisture Separator valves, controls, and internal piping was conducted. The results of these tests and inspections concluded that a primary contributor to this scram was a broken bushing on the hinge pin for the "A" Moisture Separator normal drain line check valve. The as-found condition of the check valve was evaluated as having caused the check valve to stick open. With the check valve stuck open, a backflow of condensate from the #5 feedwater heater would occur as pressure in the moisture separator decreased during CIV cycling, resulting in an increase in moisture separator level. The subject check valve was repaired prior to return from the stations third refueling outage.

END OF ABSTRACT

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#### PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor (BWR/4)  
Main Turbine (EISS Designation: TA)  
Moisture Separator (EISS Designation: SN)  
Reactor Protection System (EISS Designation: JC)  
Main Steam System (EISS Designation: SB)  
Feedwater System (EISS Designation: SJ)  
Turbine Instrumentation (EISS Designation: IT)

#### IDENTIFICATION OF OCCURRENCE

Turbine Trip on Moisture Separator High Level Results in Reactor Scram  
Due to Moisture Separator Level Control System Malfunction

Event Date: 11/17/90

Event Time: 0352

This LER was initiated by Incident Report No. 90-155

#### CONDITIONS PRIOR TO OCCURRENCE

Plant in OPERATIONAL CONDITION 1 (Power Operation), Reactor Power 100%,  
Unit Load 1100MWe.

#### DESCRIPTION OF OCCURRENCE

On 11/17/90 at 0352, during performance of a surveillance procedure which tests the Main Turbine Combined Intermediate Valves (CIV), the "A" Moisture Separator experience a high level condition. In response to this high level condition, the associated dump valve began to open, but

level continued to rise, and the main turbine tripped on moisture separator high level. Immediately following the turbine trip, the reactor scrambled on a turbine control valve closure signal from the Reactor Protection system. All plant systems responded as expected.

The "H" and "P" Safety Relief Valves (SRVs) lifted as designed to control reactor pressure, and vessel level decreased to approximately 8" (narrow range indication) during the course of the transient, well above any Emergency Core Cooling System actuation levels. Vessel level was restored using the Reactor Feedwater System. Additionally, the Redundant Reactivity Control System (RRCS) actuated on high reactor vessel pressure prior to the SRVs lifting. Control room personnel reset the scram signal, and plant parameters were stabilized in Operational Condition 3 within 30 minutes.

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#### APPARENT CAUSE OF OCCURRENCE

The primary cause of this event was equipment failure. Inspections conducted during the station's third refueling outage determined that a bushing was broken on a hinge pin from the "A" Moisture Separator normal drain line check valve. Additionally, the sluggish operation of the emergency dump valve and misoperation of moisture separator level switches may have contributed to the magnitude of the level excursion.

#### ANALYSIS OF OCCURRENCE

Refer to Attachment 1. Moisture separator level is normally controlled via the cycling of level control valves LV-1364A, B, and C, which route condensate from the Moisture Separator Drain Tank to Feedwater Heaters 5A, B, and C via individual 8" lines. In the event of a high drain tank level, the Emergency Dump Valve opens and drains directly to the Main Condenser via a single 8" line. The cycling of a CIV induces a significant transient on the associated moisture separator, and a swing in level during the course of cycling a CIV is expected, however, not as severe as was experienced in this event.

A Significant Event Response Team (SERT) was assembled following the scram, and was tasked with reviewing the scram, determining causal factors, and reviewing plant response to the transient. The SERT conducted a review of past work orders associated with the "A" Moisture Separator, performed a system walkdown, reviewed test results of data obtained on the level control system following the scram, reviewed "as-found" level control system instrumentation data, and evaluated the ability of the moisture separator le

el control system to perform as designed. Additionally, internal and external operating experience of similar events was reviewed.

The SERT drew two conclusions from the information gathered during the investigation immediately following the scram:

1. The normal drain system is capable of draining the moisture separator even under the worst case scenario which considered the unrealistic case of maximum water entrainment in the steam. The system operates properly with the drain valves nearly closed. If the valves operated sluggishly, as appears to have been the case during this scram, they may not respond rapidly enough to terminate a quick level increase as was experienced during the CIV testing. However, under normal conditions, the dump valve is available to terminate the level increase when this condition occurs.

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#### ANALYSIS OF OCCURRENCE, CONT'D

2. The dump valve was slow in responding to the rate of rise experience during this transient. The valve did not begin to stroke open until 22 seconds after the Moisture Separator Normal Level High alarm was received in the control room. At that point, the level in the Moisture Separator "A" Emergency Dump Tank had already exceeded its high level alarm point. However, post-scram testing indicates that even though the valve was slow in responding, immediately after beginning to open, a decrease in moisture separator level should have occurred.

Additional system inspections and testing were conducted during the station's third refueling outage in a continuing effort to determine the primary reason for the moisture separator level excursion. Inspection of the "A" Moisture Separator drain check valve determined that a bushing on the hinge arm of the valve was broken. The check valve has four bushings that act as bearing surfaces for the hinge pin. A review of the effects of the broken bushing by Systems Engineering concluded that at rated pressure and flow, the check valve could stick open, and backflow from #5 feedwater heater would occur due to the pressure differential between the heater and moisture separator.

#### PREVIOUS OCCURRENCES

A similar scram occurred on 1/6/90 (Ref: LER 90-001). The cause of that scram was attributed to equipment deficiencies (level control system

instrumentation tuning) and personnel error in cycling CIVs out of sequence. Corrective actions were focused on these causes. Based on the results of refueling outage inspections, it is probable that the equipment failure in the drain check valve also caused the 1/6/90 scram.

#### SAFETY SIGNIFICANCE

The potential safety impact of this event was minimal, as a plant scram is an analyzed transient, and all systems responded as expected. This event posed no threat to the health and safety of the general public.

#### CORRECTIVE ACTIONS

1. Until the Nuclear Engineering Department can completely evaluate the results of the outage tests and inspections, CIV cycling will continue to be conducted at lower power levels.

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#### CORRECTIVE ACTIONS, CONT'D

2. The emergency dump valve was disassembled, inspected, and the valve operator stroke time was adjusted following reassembly.

3. The "A" Moisture Separator level switches were exercised, calibrated, and returned to service.

4. In a continuing effort to determine the primary reason for the moisture separator level excursion, extensive inspection of the Moisture Separator and its associated components was conducted during the station's third refueling outage.

5. The drain check valve for the "A" Moisture Separator was repaired, and the drain check valve for the "B" Moisture Separator was inspected, with no discrepancies being noted.

6. Control room personnel have been instructed to immediately terminate CIV cycling during weekly testing at any point that Moisture Separator level begins increasing.

7. Further evaluation of the tests and inspections conducted during the outage will be performed by the Nuclear Engineering Department.

Sincerely,

J. J. Hagan

General Manager -  
Hope Creek Operations  
RBC/

SORC Mtg. 91-044

ATTACHMENT 1 TO 9105070075 PAGE 1 OF 1

PSE&G

Public Service Electric and Gas Company  
P.O. Box 236 Hancocks Bridge, New Jersey 08038

Hope Creek Operations

May 1, 1991

U. S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, DC 20555

Dear Sir:

HOPE CREEK GENERATING STATION  
DOCKET NO. 50-354  
UNIT NO. 1  
LICENSEE EVENT REPORT 90-028-01

This Licensee Event Report is being submitted pursuant to the  
requirements of 10CFR50.73(a)(2)(iv).

Sincerely,

J. J. Hagan  
General Manager -  
Hope Creek Operations  
RBC/

Attachment  
SORC Mtg. 91-044

C Distribution

The Energy People

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